IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.

1. - 20. (Canceled)

21. (Currently Amended) A method for producing a printed circuit board element, comprising the steps of:

mounting at least one optoelectronic component to a substrate;

subsequently applying to the substrate an optical layer, comprised of an optical material changing its refractive index under photon irradiation, while embedding the optoelectronic component in the optical layer, such that the optoelectronic component rests on the substrate and otherwise is enclosed by the optical material of the optical layer or the optoelectronic component is completely embedded in the optical material of the optical layer;

determining, by an optical vision and targeting unit, a position of the optoelectronic component embedded in the optical layer, and measuring distances on the printed circuit board element as presently formed;

subsequently controlling, by said optical vision and targeting unit, a radiation unit including a lens system to displace a focal area of an emitted laser beam, in a plane of said printed circuit board element, and adjusting the focal area also in terms of a depth within the optical layer;

and thereafter producing an optical waveguide structure adjoining the optoelectronic component within the optical layer by photon irradiation <u>in a two photon absorption process</u>, said optical waveguide structure being surrounded by the remaining optical layer.

22. (Previously Presented) The method according to claim 21, wherein at least two optoelectronic components are mounted to the substrate and embedded in the optical layer and thereafter are connected with each another by the optical waveguide directly adjoining the same.

23. (Previously Presented) The method according to claim 21, wherein after the production of the optical waveguide structure within the optical layer, a printed circuit board layer including at least one of a conductive inner ply and an outer ply is applied to at least one side of said optical layer.

24. - 25. (Canceled)

26. (Previously Presented) The method according to claim 23, wherein vias are provided in the optical layer and in the printed circuit board layer, in coordination with the respective optoelectronic component and electrically conductive connections to the optoelectronic component are established through said vias.

27. (Previously Presented) The method according to claim 26, wherein at least one electronic component, which is conductively connected with the optoelectronic component, is mounted to the printed circuit board layer and/or the substrate.

28. (Previously Presented) The method according to claim 21, wherein an optoelectronic component which is combined to a combined optoelectronic-electronic unit with an associated electronic component is mounted to the substrate and embedded in the optical layer.

29. (Canceled)

30. (Previously Presented) The method according to claim 44, wherein the cover layer is comprised of optical material, and is applied to the substrate.

31. (Canceled)

32. (Previously Presented) The method according to claim 45, wherein electrical connections for the optoelectronic component are established throughout the distribution layer.

33. (Canceled)

34. (Previously Presented) The method according to claim 21, wherein the optoelectronic component is produced in situ on the substrate by a thin-film technique.

35. - 41. (Canceled)

42. (Previously Presented) The method according to claim 23, wherein the inner ply is patterned before applying the printed circuit board layer to the optical layer.

43. (Previously Presented) The method according to claim 23, wherein the outer ply is patterned after the application of the printed circuit board layer to the optical layer.

44. (Previously Presented) The method according to claim 21, wherein the substrate is provided with at least one cover layer before applying the optoelectronic component thereto.

45. (Previously Presented) The method according to claim 44, wherein an electrically conductive cover layer is applied to the substrate as a distribution layer, said distribution layer being subsequently patterned, if required.

46. (Previously Presented) The method according to claim 45, wherein the distribution layer is configured as a heat-dissipation layer.

47. (Previously Presented) The method according to claim 21, wherein the optical waveguide structure is produced with a funnel-shaped widening on its end adjacent the optoelectronic component.

48. (Previously Presented) The method according to claim 21, wherein the optical waveguide structure is produced with an end region at least partially enclosing the optoelectronic component.

49. (Previously Presented) The method according to claim 21, wherein the optical waveguide structure is produced with a photonic light-diffractive crystal structure on its end adjacent the optoelectronic component.

50. (New) A method for producing a printed circuit board element, comprising the steps of:

mounting at least one optoelectronic component to a substrate;

subsequently applying to the substrate an optical layer, comprised of an optical material changing its refractive index under photon irradiation, while embedding the optoelectronic component in the optical layer, such that one side of the optoelectronic component abuts the substrate and all other sides of the optoelectronic component are embedded within the optical material of the optical layer or the embedded optoelectronic component is completely surrounded by the optical material of the optical layer;

determining, by an optical vision and targeting unit, a position of the optoelectronic component embedded in the optical layer, and measuring distances on the printed circuit board element as presently formed;

subsequently controlling, by said optical vision and targeting unit, a radiation unit including a lens system to displace a focal area of an emitted laser beam, in a plane of said printed circuit board element, and adjusting the focal area also in terms of a depth within the optical layer;

and thereafter producing an optical waveguide structure adjoining the optoelectronic component within the optical layer by photon irradiation in a two photon absorption process, said optical waveguide structure being surrounded by the remaining optical layer.